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DIV	SE – CE -A
DAA EXPT 2	
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AIM :	Experiment Based on Divide and Conquer Techniques 1) MERGE SORT 2) QUICK SORT

ALGORITHM :	MERGE SORT
	step 1: start
	step 2: declare array and left, right, mid variable
	step 3: perform merge function.
	if left > right
	return
	mid= (left+right)/2
	mergesort(array, left, mid)
	mergesort(array, mid+1, right)
	merge(array, left, mid, right)
	step 4: Stop
	QUICK SORT
	FOR QUICK SORT :
	QUICKSORT (array A, start, end)
	1. {
	2. 1 if (start < end)
	3. 2 {
	4. 3 p = partition(A, start, end)
	5. 4 QUICKSORT (A, start, p - 1)
	6. 5 QUICKSORT (A, p + 1, end)
	7. 6}
	8. }
	FOR PARTIONING ALGORITHM
	PARTITION (array A, start, end)
	1. {
	2. 1 pivot ? A[end]
	3. 2 i ? start-1
	4. 3 for j ? start to end -1 {

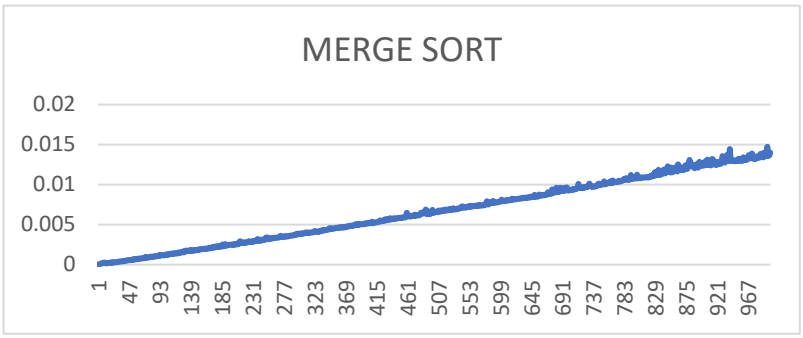
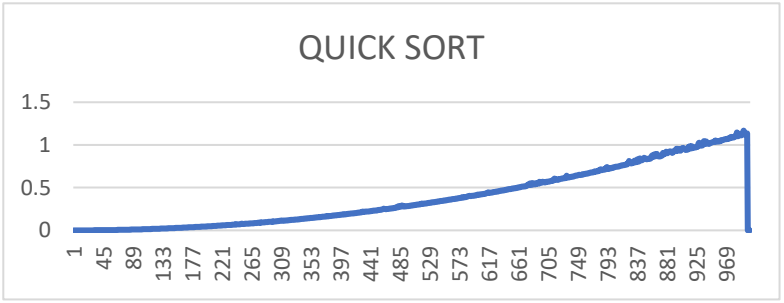
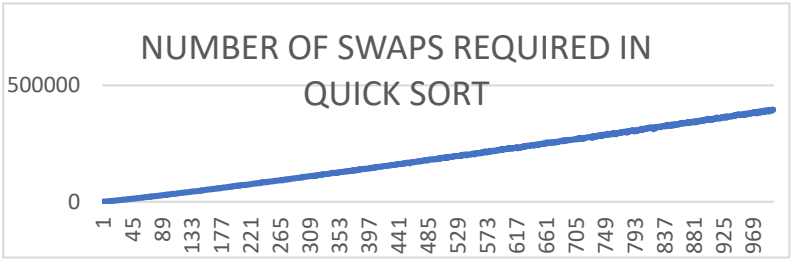
	5. 4 do if (A[j] < pivot) { **6. 5 then i ? i + 1** **7. 6 swap A[i] with A[j]** **8. 7 }}** **9. 8 swap A[i+1] with A[end]** **10. 9 return i+1** **11. }**

CODE :

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
void merge(int a[], int beg, int mid, int end)
{
   int i, j, k;
   int n1 = mid - beg + 1;
   int n2 = end - mid;
   int LeftArray[n1], RightArray[n2];
   for (int i = 0; i < n1; i++)
      LeftArray[i] = a[beg + i];
   for (int j = 0; j < n2; j++)
      RightArray[j] = a[mid + 1 + j];
   i = 0,
   j = 0;
   k = beg;
   while (i < n1 && j < n2)
   {
      if (LeftArray[i] <= RightArray[j])
      {
         a[k] = LeftArray[i];
         i++;
      }
      else
      {
         a[k] = RightArray[j];
         j++;
      }
      k++;
   }
   while (i < n1)
   {
      a[k] = LeftArray[i];
      i++;
      k++;
   }
   while (j < n2)
   {
      a[k] = RightArray[j];
      j++;
      k++;
   }
}
void mergeSort(int a[], int beg, int end)
{
   if (beg < end)
   {
      int mid = (beg + end) / 2;
      mergeSort(a, beg, mid);
      mergeSort(a, mid + 1, end);
      merge(a, beg, mid, end);
```

```
    }
}
void printArray(int a[], int n)
{
    int i;
    for (i = 0; i < n; i++)
        printf("%d ", a[i]);
    printf("\n");
}
int partition(int a[], int start, int end)
{
    int pivot = a[end];
    int i = (start - 1);
    for (int j = start; j <= end - 1; j++)
    {
        if (a[j] < pivot)
        {
            i++;
            int t = a[i];
            a[i] = a[j];
            a[j] = t;
        }
    }
    int t = a[i + 1];
    a[i + 1] = a[end];
    a[end] = t;
    return (i + 1);
}
void quick(int a[], int start, int end)
{
    if (start < end)
    {
        int p = partition(a, start, end);
        quick(a, start, p - 1);
        quick(a, p + 1, end);
    }
}
void printArr(int a[], int n)
{
    int i;
    for (i = 0; i < n; i++)
        printf("%d ", a[i]);
}
void main()
{
    int n = 0;
    for (int k = 0; k < (100000 / 100); k++)
    {
        n = n + 100;
        int num[n];
        int quicksort[n];
```

```
        int merge[n];
        int j, min;
        clock_t start_t, end_t;
        double total_t;
        printf("%d\t", n);
        for (int i = 0; i < n; i++)
        {
           num[i] = rand() % 10;
           merge[i] = num[i];
           quicksort[i] = num[i];
        }
        start_t = clock();
        mergeSort(merge, 0, n - 1);
        end_t = clock();
        total_t = (double)(end_t - start_t) / CLOCKS_PER_SEC;
        printf("%f\n", total_t);
        start_t = clock();
        quick(quicksort, 0, n - 1);
        end_t = clock();
        total_t = (double)(end_t - start_t) / CLOCKS_PER_SEC;
        printf("%f\n", total_t);
    }
}
```

GRAPHICAL REPRESENTATION :	  
OBSERVTIONS :	1) Merge sort follows a linear graph 2) Quick sort has a parabolic garph 3) Approximately 3 lakh swaps are required to sort the given Input of 1 lakh number in Quick Sort method
CONCLUSION :	Merge sort is more efficient as its worst case time complexity is O(logn) while in case of quick sort, it remains constant throughout all operations as we can see from its graph which is linear in nature.